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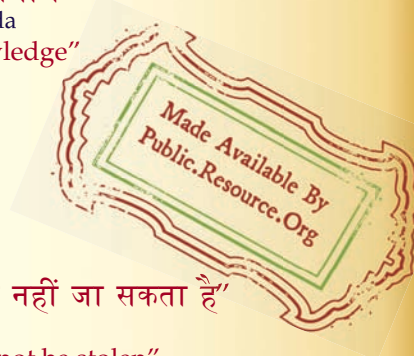
IS 5889 (1994): Vibratory plate compactor (first revision)  
[MED 18: Construction Plant and Machinery]



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भारतीय मानक  
कम्पन प्लेट संहनक — विशिष्ट  
( पहला पुनरीक्षण )

*Indian Standard*

VIBRATORY PLATE COMPACTOR —  
SPECIFICATION  
( *First Revision* )

UDC 624.138.22

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BUREAU OF INDIAN STANDARDS  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002

June 1994

Price Group 3

## FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Construction Plant and Machinery Sectional Committee had been approved by the Heavy Mechanical Engineering Division Council.

This Indian Standard was first published in 1970. In view of technological advancement in the field appropriate modification/changes has been made in this revision.

Vibratory plate compactors are mainly intended for compaction of different types of soils in narrow and restricted areas where it is not possible or economical or convenient to use large compacting machines. Compaction with the help of vibrations and impact is most effective when the soil to be compacted is of a noncohesive nature. However, the vibratory plate earth compactors may be usefully employed on sub-bases, foundations, backfills, plinth fillings, repairs of potholes and construction of helipads.

The selection of the type of vibratory plate compactors depends upon the quantity of work involved, site conditions, type of soils, thickness of layers to be compacted at a time, bearing capacity, the density of compaction required and matching of frequency of the compactor with that of the soil.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

# Indian Standard

## VIBRATORY PLATE COMPACTOR — SPECIFICATION

### ( First Revision )

#### 1 SCOPE

This standard lays down the requirements for materials, size, designation, construction and performance of self-propelled vibratory plate compactors.

#### 2 REFERENCES

The Indian Standards listed at Annex A are necessary adjunct to this standard.

#### 3 TERMINOLOGY

For the purpose of this standard, the following definitions shall apply.

##### 3.1 Amplitude of Vibration

Maximum displacement of a vibrating body from its mean position during vibration. It is usually expressed as half of the total displacement.

##### 3.2 Dry Density

The weight of soil solids per unit of total volume of soil mass.

##### 3.3 Frequency of Vibration

Number of complete cycles of vibration per minute.

##### 3.4 Standard Proctor Density

It is the specific maximum density to which the soil can be compacted by a given amount of energy at a specific moisture content [ see IS 2720 ( Part 7 ) : 1980 and IS 2720 ( Part 8 ) : 1983 ].

#### 4 DESIGNATION OF SIZE

4.1 The size of the plate compactors shall be designated by its weight in kg and the following shall be clearly indicated:

- a) Normal frequency of the vibrating mechanism and if adjustment is provided, the range of frequency.
- b) The centrifugal force in N of the vibrating element or impulse generator at the specified frequencies.

4.2 The accessories like transportation wheels, towing handle, etc, shall not be included in the

weight of the plate compactor for its designation of size.

#### 5 CAPACITY AND SIZES

5.1 The capacity and sizes of the plate compactor shall be given below:

Capacity	Size* ( Width × Length Plate )
Up to 100	300 × 500
101 to 200	400 × 600
201 to 400	550 × 900
401 to 700	700 × 1 150

\*The tolerance on width × length shall be  $\pm 10$  percent.

5.2 The capacity of the machine shall be such as the total weight be compacted up to 700 kg.

#### 6 MATERIALS

6.1 Materials used for the construction of plate compactor shall conform to the appropriate requirements of the relevant Indian Standards.

##### 6.1.1 Steel Sections, Bars and Plates

Steel sections, bars and plates shall conform to IS 2062 : 1992.

##### 6.1.2 Mild Steel Sheets

Mild steel sheets shall conform to IS 1079 : 1988.

##### 6.1.3 Rivet Bars

Rivet bars shall conform to IS 1148 : 1982.

##### 6.1.4 Springs

These shall conform to the requirements of relevant Indian Standards.

##### 6.1.5 Gear Box, Bearing Housing and Engine Base Plate

These shall be of cast iron conforming to IS 210 : 1978.

6.1.6 The gears, driving and driven shafts of the vibrating element or gear box, if any, shall be

all of cast or wrought steel and shall be suitably heat treated.

**6.1.7** Nuts and bolts shall have standard threads and shall be manufactured according to the relevant Indian Standards.

**6.1.8** Rubber shock absorber shall be of adequate strength.

## 7 ENVIRONMENTAL CONDITIONS

**7.1** The machine shall be capable of operating and storage in the environments as given in 7.1.1 and 7.1.2.

**7.1.1** The compactor shall operate satisfactorily without damage to any component when working under the following atmospheric conditions:

- a) *Temperature* — Any temperature between  $-10^{\circ}\text{C}$  and  $50^{\circ}\text{C}$ , and
- b) *Humidity* — 100 percent relative humidity at any temperature up to  $27 \pm 2^{\circ}\text{C}$ .

**7.1.1.1** The machine shall not suffer any damage to any components if kept idle under the above mentioned atmospheric conditions of temperature, humidity, wind velocity and dust storm.

### 7.1.2 Altitude

The machine shall be capable of giving its full output up to 1 500 m altitude, but space shall be available to mount a higher output engine to cater for operation up to 5 000 m when so required by user.

## 8 CONSTRUCTION

**8.1** The construction of the vibratory plate compactor in general shall be strong, robust, capable of withstanding continuous jerks and strain likely to be imposed during the operation over rough, rocky or soft grounds, at speeds up to 15 m/min.

**8.2** The machine shall consist of the following main sub-assemblies:

- a) Compacting plate;
- b) Vibration generating mechanism; and
- c) Prime mover, that is, electric motor or internal combustion engine.

### 8.2.1 Compacting Plate

The compacting plate shall be either of cast iron conforming to IS 210 : 1978 or mild steel plate conforming to IS 2062 : 1992 but in both cases the plate shall be reinforced from inside to strengthen it, so that the shock of the vibrating mechanism does not damage the plate. The

plate shall be provided with edges at right angles to it, to a sufficient height, so as not to collect loose earth when the machine sinks in the uncompacted soil in the first pass. The edges of the plate at the front and rear shall be suitably rounded off to allow smooth movement of the compactor during compaction. Provision shall be made to fix additional tamping plates at the side to increase the tamping area and decrease the tamping effect, if so desired.

#### 8.2.1.1 Dimensions

The dimensions of the compacting plate shall be as given at 5.1.

#### 8.2.2 Vibration Generating Mechanism

The recommended vibration generating system are as given below:

- a) System shall consist of rotating eccentric weight/shaft; and
- b) Reciprocal pressure generation system.

**8.2.2.1** The method and fitting of the vibrating element shall be sound and strong so that there is no risk of the entire elements breaking away from its stand. It shall be fixed to its stand by suitable bolts and nuts which shall be provided with suitable fasteners to ensure that they do not loosen up during operation. Welding shall not be used to fix the vibrating mechanism to its stand. The bearings in the element shall be of roller type and strong enough to withstand the jerks and ramming. Oil seals shall be of good quality and shall conform to relevant Indian Standard. Gears, if any, shall be of cast or wrought steel and suitably heat treated. The vibrating frequency should not be less than 2 000 cycles per minute except in case of small trench compactors where frequency may be between 500-700 cycles per minute.

#### 8.2.3 Prime Mover

The prime mover shall be an internal combustion engine conforming to IS 10001 : 1981 or IS 10002 : 1981 or a totally enclosed electric motor conforming to IS 325 : 1978. The prime mover shall have adequate output, capable of driving the equipment at a speed of 12 to 20 m/min under the conditions mentioned in 7.

##### 8.2.3.1 Internal combustion engine

When internal combustion engines are used as prime movers, the following requirements shall be met with:

- a) *Fuel system* — The fuel tank shall be of sufficient capacity to provide a minimum of 4 hours running at full load. The filling

orifice shall incorporate a removable filter and shall be of such size and so placed that filling from jerrycans without the aid of a funnel, presents no difficulty. A cap-tive filler cap shall be provided for the filling orifice and the method used for venting the tank to atmosphere shall be such that no fuel spillage occurs when the machine is operating with the fuel tank filled to maximum capacity. The draw off from the fuel tank to the engine shall have 5 percent dead volume below it at any operating angle up to 12°. A drain plug, which will enable complete draining of the tank shall be provided. If required by purchaser, the draw of fuel cock shall incorporate fuel stoppage when 15 percent fuel is left in tank so that 10 percent fuel is available to the operator as reserve when he alters the fuel lever position.

- b) *Starting gear* — The internal combustion engine shall be provided with hand/electric/hydraulic/spring starting gear. When electric starter is provided it shall be on a 12V/24V electric system. Arrangements shall also be available for hand cranking when electric/hydraulic/spring starters are provided.
- c) *Cooling* — A radiator of adequate capacity shall be provided in water cooled engines as recommended by engine manufacturers to keep the temperature of the coolant always within permissible limits. The temperature of the coolant shall be at least 10°C lower than its boiling point. In air cooled engines, it shall be ensured that the engine can give the rated performance at 54.5°C ambient without undue heating.
- d) The engine shall have class 'B1' governing.

#### 8.2.3.2 Electric motor

The electric wiring shall be sheathed and kept sufficiently loose at bends to ensure that no tension is imparted by relative movements of components. The machine shall be properly earthed. The motor shall be totally enclosed to ensure that dust does not damage the components.

#### 8.2.3.3 Prime mover base plate

The prime mover base plate may be of mild steel or cast iron. The prime mover shall be placed on this plate and suitably bolted or studded. The plate itself shall be placed upon springs fitted on the compacting plate.

#### 8.2.4 Mounting

The prime mover and the vibration generating mechanism shall be mounted on the compacting

plate. The engine shall be mounted with the help of springs and flexible mountings, to prevent the vibration from the plate reaching the engine. The flexible mountings shall be according to good engineering practice.

#### 8.2.5 Driving Handle

The handle shall be of sufficient length to give enough leverage, while manoeuvring the machine. All controls required during the operation, for example, accelerator for engine or switch for electric motors shall be positioned on the handle at the operator's end. Provision shall be there to adjust the height of the handle to suit the operator's height. The handle shall be mounted on the engine base with help of springs and shock absorbers to avoid jerks to the operator. It shall be fabricated out of steel tube conforming to IS 1239 (Part 1) : 1990 and IS 1239 (Part 2) : 1992.

8.2.6 All nuts and bolts shall be fastened/tightened with one spring washer and one plate washer. Lockwasher shall be provided where necessary.

#### 8.2.7 Safety

A steel plate shall be provided to cover the vibrating element and the eccentric weights or discs moving in the open, that is, outside the gearbox. The fitting of the cover shall be such that it stays firm in operation and does not get loosened or shifted. The cover serves as a protection against possible accidents caused due to the loosening of any part or eccentric discs on the vibrating element and hence, the machine shall not be operated without this cover on.

#### 8.2.8 Clutch

Clutches wherever provided shall be of robust construction to operate satisfactorily even while receiving residual vibrations from the compacting plate. The operation of the clutch shall be simple with the control provided, within the reach of the operator while operating the machine. The clutch in the case of an IC engine shall consist of a V-belt driving pulley with a centrifugal clutch mechanism. This shall enable the starting of the engine without load and stopping of the machine any time by the operator by merely reducing the speed by shifting a lever mounted on the steering handle. This clutch shall also make it convenient for the operator to restart the machine just by increasing the speed. In the case of an electric motor drive, the clutch, however, may not be employed and the starting and stopping may be done through an iron clad switch fixed to the steering handle.



**8.2.9** A belt tensioner or stretcher device should be provided in the space between the vibrating element and prime-mover to maintain suitable tension on the V-belts. This device shall adjust the tension automatically and shall be also manually adjustable when belts become too stretched.

#### **8.2.10 V-Bells**

V-belts shall be made of nylon cord and of section B or higher, capable to withstand the stresses and shall conform to IS 2494 : 1974.

### **9 PERFORMANCE**

#### **9.1 Compaction**

Plate compactors of all sizes shall be capable of given compacted dry density equal to the 90 percent proctor density up to depths ranging from 13 cm to 30 cm depending on the size and capacity of machine and type of soil compacted.

#### **9.2 Area of Coverage**

Area of coverage in a single pass basis shall be not less than the figures specified below for each size of the compactor, while achieving degree compaction as specified in 9.1.

<i>Size of Compactor</i>	<i>Area of Coverage</i>
kg	m <sup>2</sup> /h
Up to 100	279
( Trench Compactor )	
101 to 200	372
201 to 400	465
401 to 700	557

#### **9.3 Gradient**

Compactors of all sizes shall be capable of negotiating slopes up to 1 in 5 on a compacted bed of soil. On models 700 kg and above, a warping capstan shall be provided in front of the machine as an optional accessory to assist forward movement, when operating on inclines or on wet slippery soils and for debogging the machine.

### **10 TRANSPORTATION**

For short movements of the equipment from site to site, provision shall be made for fitting wheels and a towing attachment without the aid of any special tools or crane in a short time. This provision shall also be used for loading into trucks with the help of a suitable equipment.

### **11 GENERAL**

**11.1** During design and construction, efforts shall be made to isolate the parts, which are not required to be vibrated, from the vibration

mechanism, by the provision of anti-vibration mountings, shock absorbers and transmission of power by 'V'-belts, etc. Provision of anti-vibration mountings to prevent transmission of vibrations from one part to the other would ensure longer life of the prime mover and less fatigue to the operator. Special attention shall be given to ensure that suitable rubber shock absorbers or buffers are provided to save prime mover and steering handle from vibrations and shocks from the vibrating plate.

**11.2** All parts of the equipment requiring frequent replacement, constant attention or periodical servicing shall be easily accessible without dismantling any fitment or parts.

**11.3** Safety guards for moving parts shall be provided. The parts which are exposed to atmosphere and are liable to become defective/worn out due to exposure to dust shall be adequately protected.

**11.4** Provision for lubricating all moving parts shall be provided, keeping the maintenance schedule as simple as possible.

**11.5** The engine should be silenced to reduce fatigue of the operator, when specifically asked for.

### **12 DOCUMENTS**

**12.1** The following documents shall be provided along with the machine:

- Instruction manual cum operators instructions;
- Workshop manual* — This document shall have all details which are necessary in dismantling, maintenance, and assembly of all components;
- Spare parts list with exploded view of the machines showing the sequence of assembly of all parts; and
- List of tools which are provided and required to carry out repairs and maintenance of the machine.

### **13 ADDITIONAL ACCESSORIES**

**13.1** The following additional accessories may be provided if specifically ordered for by the user:

- Arrangement to fix extra tamping plates on the sides of the tamping plate of the compactor;
- Pneumatic wheels in place of solid rubber wheels for making the compactor easy to tow; and

- c) Tarpaulin cover with arrangements to lock the same to ensure that the machine can be left at site duly protected from environmental conditions and pilferage.

## 14 MARKING

**14.1** Each compactor shall have a rating plate firmly attached to some part which will not be easily removable and exposed to out-side. The plate shall have clearly marked on it the following information:

- Manufacturer's name and address;
- Machine reference number;
- Size of the compactor;
- Prime mover make and output;
- Speed, kVA rating, voltage and frequency (in case the prime mover is an electric motor);

- f) Year of manufacture;

- g) Frequency of vibration at rated engine speed and centrifugal force in N; and

- h) Angle of vibrating mechanism plate and variations in angle, if possible.

### 14.1.1 BIS Certification Marking

**14.1.1.1** The vibratory plate compactor may also be marked with Standard Mark.

**14.1.1.2** The use of the Standard Mark is governed by the provisions of Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

## ANNEX A

( Clause 2 )

### LIST OF REFERRED INDIAN STANDARDS

IS No.	Title	IS No.	Title
210 : 1978	Grey iron castings ( <i>third revision</i> )	2494 : 1974	V-belts for industrial purposes ( <i>first revision</i> )
325 : 1978	Three-phase induction motors ( <i>fourth revision</i> )	2720 ( Part 7 ) : 1980	Methods of test for soils : Part 7 Determination of water content dry density relation using light compaction ( <i>second revision</i> )
1079 : 1988	Hot-rolled carbon steel sheet and strip ( <i>fourth revision</i> )	2720 ( Part 8 ) : 1983	Methods of test for soils : Part 8 Determination of water content dry density relation using heavy compaction ( <i>second revision</i> )
1448 : 1982	Hot-rolled rivet bars ( up to 40 mm dia ) for structural purposes ( <i>third revision</i> )	10001 : 1981	Performance requirements for constant speed compression ignition ( diesel ) engines for general purposes ( up to 20 kW )
1239 ( Part 1 ) : 1990	Mild steel tubes, tubulars and other wrought steel fittings : Part 1 Mild steel tubes ( <i>fifth revision</i> )	10002 : 1981	Performance requirements for constant speed compression ignition ( diesel ) engines for general purposes ( above 20 kW )
1239 ( Part 2 ) : 1992	Mild steel tubes, tubulars and other wrought steel fittings : Part 2 Mild steel tubulars and other wrought steel pipe fittings ( <i>third revision</i> )		
2062 : 1992	Steel for general structural purposes ( <i>fourth revision</i> )		

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### Revision of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Handbook' and 'Standards Monthly Additions'.

This Indian Standard has been developed from Doc : No. HMD 18 ( 0113 ).

### Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

## BUREAU OF INDIAN STANDARDS

### Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002  
Telephones : 331 01 31, 331 13 75

Telegrams : Manaksanstha  
( Common to all Offices )

### Regional Offices :

Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg  
NEW DELHI 110002

### Telephone

{ 331 01 31  
{ 331 13 75

Eastern : 1/14 C. I. T. Scheme VII M, V. I. P. Road, Maniktola  
CALCUTTA 700054

{ 37 84 99, 37 85 61  
{ 37 86 26, 37 86 62

Northern : SCO 445-446, Sector 35-C, CHANDIGARH 160036

{ 53 38 43, 53 16 40  
{ 53 23 84

Southern : C. I. T. Campus, IV Cross Road, MADRAS 600113

{ 235 02 16, 235 04 42  
{ 235 15 19, 235 23 15

Western : Manakalaya, E9 MIDC, Marol, Andheri ( East )  
BOMBAY 400093

{ 632 92 95, 632 78 58  
{ 632 78 91, 632 78 92

Branch : AHMADABAD. BANGALORE. BHOPAL. BHUBANESHWAR. COIMBATORE.  
FARIDABAD. GHAZIABAD. GUWAHATI. HYDERABAD. JAIPUR. KANPUR  
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